

Laboratory Technology. These agencies have different requirements for certification and different organizational sponsors.

Clinical laboratory personnel need good analytical judgment and the ability to work under pressure. Close attention to detail is essential, because small differences or changes in test substances or numerical readouts can be crucial for patient care. Manual dexterity and normal color vision are highly desirable. With the widespread use of automated laboratory equipment, computer skills are important. In addition, technologists in particular are expected to be good at problem solving.

Technologists may advance to supervisory positions in laboratory work or become chief medical or clinical laboratory technologists or laboratory managers in hospitals. Manufacturers of home diagnostic testing kits and laboratory equipment and supplies seek experienced technologists to work in product development, marketing, and sales. Graduate education in medical technology, one of the biological sciences, chemistry, management, or education usually speeds advancement. A doctorate is needed to become a laboratory director. However, federal regulation allows directors of moderate complexity laboratories to have either a master's degree or a bachelor's degree combined with the appropriate amount of training and experience. Technicians can become technologists through additional education and experience.

Job Outlook

Employment of clinical laboratory workers is expected to grow about as fast as the average for all occupations through the year 2008, as the volume of laboratory tests increases with population growth and the development of new types of tests. Hospitals and independent laboratories have recently undergone considerable consolidation and restructuring, to boost productivity and allow the same number of personnel to perform more tests than previously possible. Consequently, competition for jobs has increased; and individuals may now have to spend more time seeking employment than in the past.

Technological advances will continue to have two opposing effects on employment through 2008. New, increasingly powerful diagnostic tests will encourage additional testing and spur employment. However, advances in laboratory automation and simple tests, which make it possible for each worker to perform more tests, should slow growth. Research and development efforts are targeted at simplifying routine testing procedures, so nonlaboratory personnel, physicians and patients, in particular, can perform tests now done in laboratories. In addition, automation may be used to prepare specimens, a job traditionally done by technologists and technicians.

Although significant, growth will not be the only source of opportunities. As in most occupations, many openings will result from the need to replace workers who transfer to other occupations, retire, or stop working for some other reason.

Earnings

Median annual earnings of clinical laboratory technologists and technicians were \$32,440 in 1998. The middle 50 percent earned between \$24,970 and \$39,810 a year. The lowest 10 percent earned less than \$19,380 and the highest 10 percent earned more than \$48,290 a year. Median annual earnings in the industries employing the largest numbers of medical and clinical laboratory technologists in 1997 were:

Offices and clinics of medical doctors .....	\$40,300
Federal Government .....	39,600
Hospitals .....	36,500
Medical and dental laboratories .....	35,600

Median annual earnings in the industries employing the largest numbers of medical and clinical laboratory technicians in 1997 were:

Hospitals .....	\$26,600
Offices and clinics of medical doctors .....	25,500
Medical and dental laboratories .....	24,800
Health and allied services, not elsewhere classified .....	22,400

Related Occupations

Clinical laboratory technologists and technicians analyze body fluids, tissue, and other substances using a variety of tests. Similar or related procedures are performed by analytical, water purification, and other chemists; science technicians; crime laboratory analysts; food testers; and veterinary laboratory technicians.

Sources of Additional Information

Career and certification information is available from:

- ☛ American Society of Clinical Pathologists, Board of Registry, P.O. Box 12277, Chicago, IL 60612. Internet: <http://www.ascp.org/bor>
- ☛ American Medical Technologists, 710 Higgins Rd., Park Ridge, IL 60068. Internet: <http://www.amt1.com>
- ☛ American Society of Cytopathology, 400 West 9th St., Suite 201, Wilmington, DE 19801.
- ☛ International Society for Clinical Laboratory Technology, 917 Locust St., Suite 1100, St. Louis, MO 63101-1413.

For more career information, write to:

- ☛ American Society for Clinical Laboratory Science, 7910 Woodmont Ave., Suite 530, Bethesda, MD 20814.
- ☛ American Association of Blood Banks, 8101 Glenbrook Rd., Bethesda, MD 20814-2749.

For a list of accredited and approved educational programs for clinical laboratory personnel, write to:

- ☛ National Accrediting Agency for Clinical Laboratory Sciences, 8410 W. Bryn Mawr Ave., Suite 670, Chicago, IL 60631.

For a list of training programs for medical and clinical laboratory technicians accredited by the Accrediting Bureau of Health Education Schools, write to:

- ☛ Accrediting Bureau of Health Education Schools, 803 West Broad St., Suite 730, Falls Church, VA 22046. Internet: <http://www.abhes.org>

For information about a career as a medical and clinical laboratory technician and schools offering training, contact:

- ☛ National Association of Health Career Schools, 2301 Academy Dr., Harrisburg, PA 17112.

Dental Hygienists

(O\*NET 32908)

Significant Points

- Dental hygienists are projected to be one of the 30 fastest growing occupations.
- Population growth and greater retention of natural teeth will stimulate demand for dental hygienists.
- Opportunities for part-time work and flexible schedules are common.

Nature of the Work

Dental hygienists clean teeth and provide other preventive dental care, as well as teach patients how to practice good oral hygiene. Hygienists examine patients' teeth and gums, recording the presence of diseases or abnormalities. They remove calculus, stains, and plaque from teeth; take and develop dental x rays; and apply cavity preventive agents such as fluorides and pit and fissure sealants. In some States, hygienists administer local anesthetics and anesthetic gas; place and carve filling materials, temporary fillings, and periodontal dressings; remove sutures; and smooth and polish metal restorations.

Dental hygienists also help patients develop and maintain good oral health. For example, they may explain the relationship between diet and oral health, inform patients how to select toothbrushes, and show patients how to brush and floss their teeth.

Dental hygienists use hand and rotary instruments, lasers, and ultrasonics to clean teeth; x-ray machines to take dental pictures; syringes with needles to administer local anesthetics; and models of teeth to explain oral hygiene.



*Dental hygienists clean and examine teeth and gums, noting the presence of diseases or abnormalities.*

### Working Conditions

Flexible scheduling is a distinctive feature of this job. Full-time, part-time, evening, and weekend work is widely available. Dentists frequently hire hygienists to work only 2 or 3 days a week, so hygienists may hold jobs in more than one dental office.

Dental hygienists work in clean, well-lighted offices. Important health safeguards include strict adherence to proper radiological procedures, and use of appropriate protective devices when administering anesthetic gas. Dental hygienists also wear safety glasses, surgical masks, and gloves to protect themselves from infectious diseases.

### Employment

Dental hygienists held about 143,000 jobs in 1998. Because multiple job holding is common in this field, the number of jobs exceeds the number of hygienists. About 3 out of 5 dental hygienists worked part time—less than 35 hours a week.

Almost all dental hygienists work in private dental offices. Some work in public health agencies, hospitals, and clinics.

### Training, Other Qualifications, and Advancement

Dental hygienists must be licensed by the State in which they practice. To qualify for licensure, a candidate must graduate from an accredited dental hygiene school and pass both a written and clinical examination. The American Dental Association Joint Commission on National Dental Examinations administers the written examination accepted by all States and the District of Columbia. State or regional testing agencies administer the clinical examination. In addition, most States require an examination on legal aspects of

dental hygiene practice. Alabama allows candidates to take its examinations if they have been trained through a State-regulated on-the-job program in a dentist's office.

In 1999, the Commission on Dental Accreditation accredited about 250 programs in dental hygiene. Although some programs lead to a bachelor's degree, most grant an associate degree. Thirteen universities offer master's degree programs in dental hygiene or a related area.

An associate degree is sufficient for practice in a private dental office. A bachelor's or master's degree is usually required for research, teaching, or clinical practice in public or school health programs.

About half of the dental hygiene programs prefer applicants who have completed at least 1 year of college. However, requirements vary from school to school. Schools offer laboratory, clinical, and classroom instruction in subjects such as anatomy, physiology, chemistry, microbiology, pharmacology, nutrition, radiography, histology (the study of tissue structure), periodontology (the study of gum diseases), pathology, dental materials, clinical dental hygiene, and social and behavioral sciences.

Dental hygienists should work well with others and must have good manual dexterity because they use dental instruments within a patient's mouth with little room for error. High school students interested in becoming a dental hygienist should take courses in biology, chemistry, and mathematics.

### Job Outlook

Employment of dental hygienists is expected to grow much faster than the average for all occupations through 2008, in response to increasing demand for dental care and the greater substitution of hygienists for services previously performed by dentists. Job prospects are expected to remain very good unless the number of dental hygienist program graduates grows much faster than during the last decade, and results in a much larger pool of qualified applicants.

Population growth and greater retention of natural teeth will stimulate demand for dental hygienists. Older dentists, who are less likely to employ dental hygienists, will leave and be replaced by recent graduates, who are more likely to do so. In addition, as dentists' workloads increase, they are expected to hire more hygienists to perform preventive dental care such as cleaning, so they may devote their own time to more profitable procedures.

### Earnings

Median hourly earnings of dental hygienists were \$22.06 in 1998. The middle 50 percent earned between \$17.28 and \$29.28 an hour. The lowest 10 percent earned less than \$12.37 and the highest 10 percent earned more than \$38.81 an hour.

Earnings vary by geographic location, employment setting, and years of experience. Dental hygienists who work in private dental offices may be paid on an hourly, daily, salary, or commission basis.

Benefits vary substantially by practice setting, and may be contingent upon full-time employment. Dental hygienists who work for school systems, public health agencies, the Federal Government, or State agencies usually have substantial benefits.

### Related Occupations

Workers in other occupations supporting health practitioners in an office setting include dental assistants, ophthalmic medical assistants, podiatric medical assistants, office nurses, medical assistants, physician assistants, physical therapist assistants, and occupational therapy assistants.

### Sources of Additional Information

For information on a career in dental hygiene and the educational requirements to enter this occupation, contact:

➤ Division of Professional Development, American Dental Hygienists' Association, 444 N. Michigan Ave., Suite 3400, Chicago, IL 60611. Internet: <http://www.adha.org>

For information about accredited programs and educational requirements, contact:

☛ Commission on Dental Accreditation, American Dental Association, 211 E. Chicago Ave., Suite 1814, Chicago, IL 60611.

Internet: <http://www.ada.org>

The State Board of Dental Examiners in each State can supply information on licensing requirements.

## Electroneurodiagnostic Technologists

(O\*NET 32923)

### Significant Points

- The number of job openings created will be limited by slower than average employment growth and low replacement needs.
- Most technologists learn on the job, but opportunities should be best for technologists with formal postsecondary training.

### Nature of the Work

Electroneurodiagnostic technologists use instruments such as an electroencephalograph (EEG) machine, to record electrical impulses transmitted by the brain and the nervous system. They help physicians diagnose brain tumors, strokes, epilepsy, and sleep disorders. They also measure the effects of infectious diseases on the brain, as well as determine whether individuals with mental or behavioral problems have an organic impairment, such as Alzheimer's disease. Furthermore, they determine *cerebral death*, the absence of brain activity, and assess the probability of recovery from a coma.

Electroneurodiagnostic technologists who specialize in basic or *resting* EEGs are called *EEG technologists*. The range of tests performed by electroneurodiagnostic technologists is broader than, but includes, those conducted by EEG technologists. Because it provides a more accurate description of work typically performed in the field, the title electroneurodiagnostic technologists generally has replaced that of EEG technologist.

Electroneurodiagnostic technologists take patients' medical histories, help patients relax, and then apply electrodes to designated spots on the patient's head. They must choose the most appropriate combination of instrument controls and electrodes, to correct for mechanical and electrical interference from somewhere other than the brain, such as eye movement or radiation from electrical sources.

Increasingly, technologists perform EEGs in the operating room, which requires that they understand anesthesia's effect on brain waves. For special procedure EEGs, technologists may secure electrodes to the chest, arm, leg, or spinal column, to record activity from both the central and peripheral nervous systems.

In ambulatory monitoring, technologists attach small recorders to patients to monitor the brain, and sometimes the heart, while patients carry out normal activities over a 24-hour period. They then remove the recorder and obtain a readout. Technologists review the readouts, selecting sections for the physician to examine.

Using *evoked potential* testing, technologists measure sensory and physical responses to specific stimuli. After attaching electrodes to the patient, they set the instrument for the type and intensity of the stimulus, increase the intensity until the patient reacts, and note the sensation level.

For nerve conduction tests, used to diagnose muscle and nerve problems, technologists place electrodes on the patient's skin over a nerve and over a muscle. Then they stimulate the nerve with an electrical current and record how long it takes the nerve impulse to reach the muscle.

Technologists who specialize in and administer sleep disorder studies are called *polysomnographic technologists*. Sleep disorder

studies are usually conducted in a clinic called a sleep center. During the procedure, these technologists monitor the patient's respiration and heart and brain wave activity. These workers must know the dynamics of the cardiopulmonary systems during each stage of sleep. They coordinate readings from several organ systems, separate the readings according to the stages of sleep, and relay results to the physician. Polysomnographic technologists may also write technical reports summarizing test results.

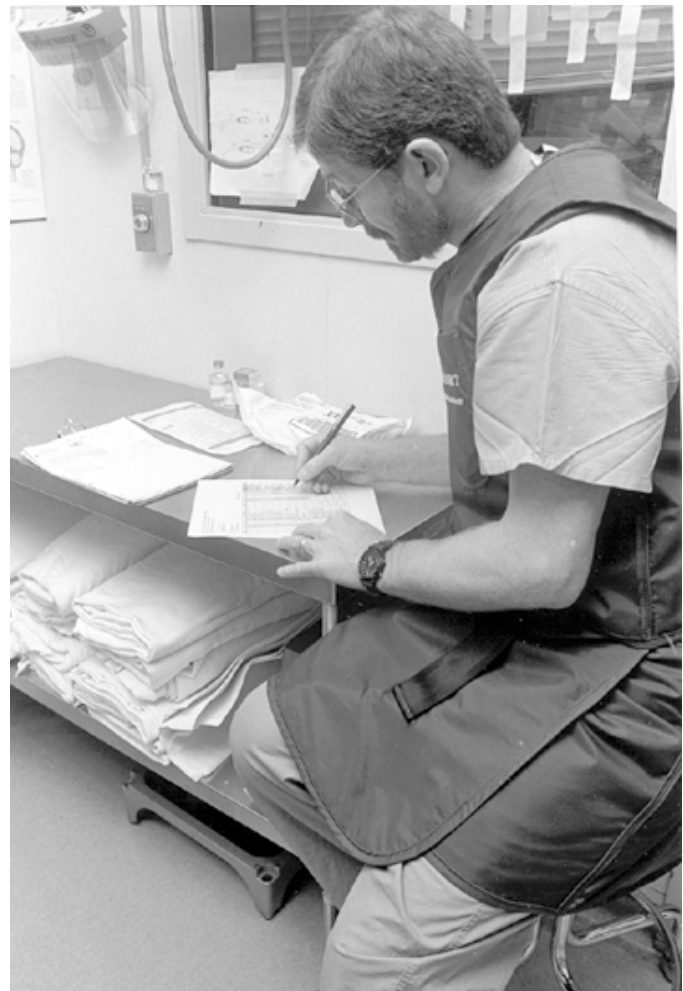
Additionally, technologists look for changes in a patient's neurologic, cardiac, and respiratory status, which may indicate an emergency, such as a heart attack, and provide emergency care until help arrives.

Electroneurodiagnostic technologists may have supervisory or administrative responsibilities. They may manage an electroneurodiagnostic laboratory, arrange work schedules, keep records, schedule appointments, order supplies, provide instruction to less-experienced technologists, and maintain equipment.

### Working Conditions

Electroneurodiagnostic technologists usually work in clean, well-lighted surroundings and spend about half of their time on their feet. They often work with patients who are very ill and require assistance. Technologists employed in hospitals may do all their work in a single room or may push equipment to a patient's bedside and obtain recordings there.

Most technologists work a standard workweek, although those in hospitals may be on call evenings, weekends, and holidays. Those performing sleep studies usually work evenings and nights.



An electroneurodiagnostic technologist evaluates the results of an electroencephalograph (EEG).